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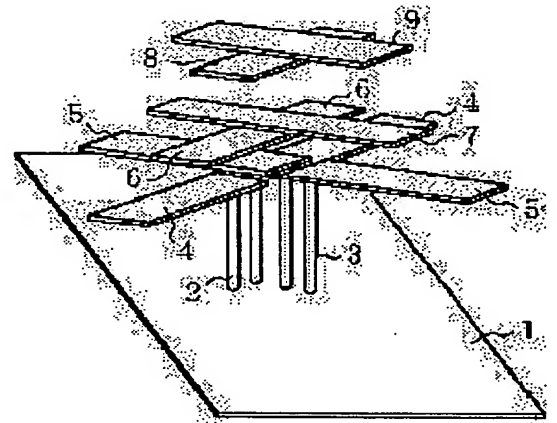
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## (54) DIVERSITY ANTENNA DEVICE

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To solve the problem with a conventional constitution where, as a plurality of same shape antennae are combined for the diversity, a large space for installation is required and, further, when a shape of a reflection plate is changed in order to obtain the antenna device with a different beam shape, the beam shapes of two wavelengths are changed simultaneously, so that it is difficult to design individually for the respective wavelengths.

**SOLUTION:** Dipole antennas 4 and 5 which have lengths of a half of a 1st wavelength are provided above a rectangular ground conductor 1 at different heights. Further, two rectangular flat conductor plates 6 and 7 which have lengths of a half of a 2nd wavelength shorter than the 1st wavelength, and two rectangular flat conductor plates 8 and 9 which have lengths of not longer than a half of the 2nd wavelengths, are provided above the rectangular ground conductor 1 in parallel with the dipole antennas 4 and 5 respectively.



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**CLAIMS**


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**[Claim(s)]**

[Claim 1] The height from a conductor differs, respectively. the rectangular ground — a conductor and this ground — a conductor — parallel — said ground — The dipole antenna pair which consists of two dipole antennas which have one half of the die length of the 1st wavelength of the electric waves from which the frequency which it is installed so that it may intersect perpendicularly mutually, and each transmits and receives differs, said ground from near the center of said dipole antenna pair — with 2 sets of feeder ways for extending in a vertical, and said dipole antenna being alike in the direction of a conductor, respectively, and supplying electric power to it It is located in the opposite side with a side. said dipole antenna pair — parallel — said dipole antenna pair — receiving — said ground — a conductor — said ground — the rectangle of two rectangles in which the height from a conductor differs, respectively, and it is arranged so that it may intersect perpendicularly mutually, and each has one half of the die length of the 2nd wavelength shorter than said 1st wavelength — a conductor — the 1st conductor which consists of a plate — with \*\*\*\* The height from a conductor differs, respectively. said 1st conductor — \*\*\*\* — parallel — said ground — a conductor — a side — the opposite side — being located — said ground — and the rectangle of two rectangles in which it is arranged so that it may intersect perpendicularly mutually, and each has the 1/2 or less die length of said 2nd wavelength — a conductor — the 2nd conductor which consists of a plate — the diversity antenna equipment characterized by having \*\*\*\*.

[Claim 2] The height from a conductor differs, respectively. the rectangular ground — a conductor and this ground — a conductor — parallel — said ground — The dipole antenna pair which consists of two dipole antennas which have one half of the die length of the 1st wavelength of the electric waves from which the frequency which it is installed, and is transmitted and received so that it may intersect perpendicularly mutually differs, said ground from near the center of said dipole antenna pair — with 2 sets of feeder ways for extending in a vertical, and said dipole antenna being alike in the direction of a conductor, respectively, and supplying electric power to it said dipole antenna pair — parallel — said dipole antenna pair — receiving — said ground — a conductor — the 1st square conductor with which it is located in the opposite side with a side, and one side has one half of the die length of the 2nd wavelength shorter than said 1st wavelength — with a plate said 1st conductor — a plate — parallel — said ground — a conductor — the 2nd square conductor with which it is located in the opposite side with a side, and one side has the 1/2 or less die length of said 2nd wavelength — the diversity antenna equipment characterized by having a plate.

[Claim 3] the 2nd conductor — the rectangle which constitutes \*\*\*\* — a conductor — the diversity antenna equipment according to claim 1 characterized by setting it as die length which omits one side of a plate or is different from another side.

[Claim 4] the 2nd conductor — the rectangle which constitutes \*\*\*\* — a conductor — two or more conductors which arranged both both [ one side or ] in the shape of a strip of paper — the shape of a strip of paper which consists of a piece — a conductor — replacing — said conductor — the diversity antenna equipment according to claim 1 with which die length is 1/2 or less [ of the 2nd wavelength ], and, as for a piece, width of face is characterized by being a sufficiently small rectangle compared with the 2nd wavelength.

[Claim 5] the 2nd conductor — two or more conductors which arranged the plate in the shape of a strip of paper — the shape of 2 sets of strips of paper which consists of pieces — a conductor — replacing — said conductor — the die length of a piece or less [ of the 2nd wavelength ] by 1/2 said conductor — the width of face of a piece — the 2nd wavelength — comparing — a sufficiently small rectangle — it is — the shape of said strip of paper — one side of a conductor — the conductor — the longitudinal direction of a piece — the

longitudinal direction of one dipole antenna — a list — the shape of said strip of paper — another side of a conductor — the conductor — the diversity antenna equipment according to claim 2 characterized by the longitudinal direction of a piece arranging to the longitudinal direction of the dipole antenna of another side. [Claim 6] the 2nd conductor — a plate — a rectangular rectangle — a conductor — the diversity antenna equipment according to claim 2 characterized by transposing to a plate.

[Claim 7] both both [ either or ] which constitute a dipole antenna pair — receive — die length — the rectangle of  $1/2$  or less rectangle of the 2nd wavelength — a conductor — two plates — the ground — diversity antenna equipment given [ of claim 1 to the claims 6 which be in a field parallel to a conductor , and be characterize by having arrange to the both sides side side of said dipole antenna , respectively so that it may be parallel to said dipole antenna and said dipole antenna may be insert ] in any 1 term .

[Claim 8] Diversity antenna equipment given [ of claim 1 to the claims 7 characterized by installing the dipole antenna of another side, and the center line of the feeder way in the field which intersects perpendicularly the node of one dipole antenna and its feeder way to the longitudinal direction of one / a passage and / said / dipole antenna ] in any 1 term.

[Claim 9] Diversity antenna equipment according to claim 8 characterized by leaning and installing the feeder way which supplies electric power to one dipole antenna in the dipole antenna side of another side.

[Claim 10] the longitudinal direction of each component of a dipole antenna pair, and the ground — diversity antenna equipment given [ of claim 1 to the claims 9 characterized by having the include angle whose longitudinal direction of a conductor is 45 degrees ] in any 1 term.

[Claim 11] either of the two dipole antennas which constitute a dipole antenna pair, or both — setting — the point — the ground — a conductor — diversity antenna equipment given [ of claim 1 to the claims 10 characterized by making it incline in a side ] in any 1 term.

[Claim 12] the ground — the edge in alignment with the longitudinal direction of a conductor — bending — further — an all directions form — a conductor — diversity antenna equipment given [ of claim 1 to the claims 11 characterized by changing the die length of a plate according to an individual ] in any 1 term.

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[Translation done.]

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the frequency-sharing diversity antenna equipment used for the base station of a walkie-talkie terminal.

[0002]

[Description of the Prior Art] As a configuration of this conventional kind of antenna equipment, there are some which were announced by Institute of Electronics, Information and Communication Engineers technical report A-P 97-73 "a design of 120 degree beam antenna of base station 2 cycle common [ for mobile communication ]" in 1997. Drawing 12 is the perspective view showing the outline structure. In drawing, this antenna constitutes a corner reflector antenna and consists of a reflecting plate 31 and a 2 cycle common radiating element 32. A reflecting plate 31 has the reflective pieces 31a and 31b with a predetermined aperture angle of two sheets, and the edge of each reflective piece is bent in order to make an antenna configuration thin.

[0003] Although the electromagnetic wave emitted from 2 cycle common radiating element 32 is reflected with a reflecting plate 31 and the desired shape of beam is obtained with this antenna, the directivity within a horizontal plane for it is decided with the aperture angle, vertical-angle distance (the corner of a reflecting plate 31, and distance of a radiating element 32), and reflecting plate width of face of a reflecting plate 31.

[0004]

[Problem(s) to be Solved by the Invention] It is effective in order that the diversity by two or more antennas may raise transmission efficiency in the system used in a multiple wave propagation environment like a walkie-talkie terminal. Since conventional frequency-sharing antenna equipment is constituted as mentioned above, in order to perform diversity, it is necessary to install, combining an isomorphism-like antenna two or more, and there is a problem that an antenna is enlarged. moreover, since the shape of beam in two wavelength will change to coincidence if it is necessary to change the configuration of a reflecting plate and the configuration of a reflecting plate is changed in order to manufacture the antenna of the different shape of beam, the design according to individual in each wavelength is difficult — etc. — the technical problem occurred.

[0005] It was made in order that this invention might solve the above technical problems, and it aims at obtaining the diversity antenna equipment which can be miniaturized comparatively. Moreover, this invention aims at obtaining the diversity antenna equipment which makes easy a change of the shape of beam in each wavelength.

[0006]

[Means for Solving the Problem] The diversity antenna equipment concerning this invention The height from a conductor differs, respectively. the rectangular ground — a conductor and this ground — a conductor — parallel — said ground — The dipole antenna pair which consists of two dipole antennas which have one half of the die length of the 1st wavelength of the electric waves from which the frequency which it is installed so that it may intersect perpendicularly mutually, and each transmits and receives differs, said ground from near the center of said dipole antenna pair — with 2 sets of feeder ways for extending in a vertical, and said dipole antenna being alike in the direction of a conductor, respectively, and supplying electric power to it It is located in the opposite side with a side. said dipole antenna pair — parallel — said dipole antenna pair — receiving — said ground — a conductor — said ground — the rectangle of two rectangles in which the height from a conductor differs, respectively, and it is arranged so that it may intersect perpendicularly mutually, and each has one half of the die length of the 2nd wavelength shorter than said 1st wavelength — a conductor — the 1st conductor which consists of a plate — with \*\*\*\* The height from a conductor differs, respectively. said 1st conductor — \*\*\*\* — parallel — said ground — a conductor — a side — the opposite side — being located — said ground — and

the rectangle of two rectangles in which it is arranged so that it may intersect perpendicularly mutually, and each has the  $1/2$  or less die length of said 2nd wavelength — a conductor — the 2nd conductor which consists of a plate — it has \*\*\*\*.

[0007] The diversity antenna equipment concerning this invention The height from a conductor differs, respectively. the rectangular ground — a conductor and this ground — a conductor — parallel — said ground — The dipole antenna pair which consists of two dipole antennas which have one half of the die length of the 1st wavelength of the electric waves from which the frequency which it is installed, and is transmitted and received so that it may intersect perpendicularly mutually differs, said ground from near the center of said dipole antenna pair — with 2 sets of feeder ways for extending in a vertical, and said dipole antenna being alike in the direction of a conductor, respectively, and supplying electric power to it said dipole antenna pair — parallel — said dipole antenna pair — receiving — said ground — a conductor — the 1st square conductor with which it is located in the opposite side with a side, and one side has one half of the die length of the 2nd wavelength shorter than said 1st wavelength — with a plate said 1st conductor — a plate — parallel — said ground — a conductor — the 2nd square conductor with which it is located in the opposite side with a side, and one side has the  $1/2$  or less die length of said 2nd wavelength — it has a plate.

[0008] the diversity antenna equipment concerning this invention — the 2nd conductor — the rectangle which constitutes \*\*\*\* — a conductor — it is set as die length which omits one side of a plate or is different from another side.

[0009] the diversity antenna equipment concerning this invention — the 2nd conductor — the rectangle which constitutes \*\*\*\* — a conductor — two or more conductors which arranged both both [ one side or ] in the shape of a strip of paper — the shape of a strip of paper which consists of a piece — a conductor — replacing — said conductor — die length is  $1/2$  or less [ of the 2nd wavelength ], and width of face makes a piece a sufficiently small rectangle compared with the 2nd wavelength.

[0010] The diversity antenna equipment concerning this invention Die length of a piece is  $1/2$  or less [ of the 2nd wavelength ], the 2nd conductor — two or more conductors which arranged the plate in the shape of a strip of paper — the shape of 2 sets of strips of paper which consists of pieces — a conductor — replacing — said conductor — width of face — the 2nd wavelength — comparing — a sufficiently small rectangle — it is — the shape of said strip of paper — one side of a conductor — the conductor — the longitudinal direction of a piece — the longitudinal direction of one dipole antenna — a list and the shape of said strip of paper — another side of a conductor — the conductor — the longitudinal direction of a piece arranges to the longitudinal direction of the dipole antenna of another side.

[0011] the diversity antenna equipment concerning this invention — the 2nd conductor — a plate — a rectangular rectangle — a conductor — it transposes to a plate.

[0012] both both [ either or ] from which the diversity antenna equipment concerning this invention constitutes a dipole antenna pair — receiving — die length — the rectangle of  $1/2$  or less rectangle of the 2nd wavelength — a conductor — two plates — the ground — it is in a field parallel to a conductor, it is parallel to said dipole antenna, and it arranges to that both-sides side side, respectively so that said dipole antenna may be inserted.

[0013] The diversity antenna equipment concerning this invention installs the dipole antenna of another side, and the center line of that feeder way in the field which intersects perpendicularly the node of one dipole antenna and its feeder way to the longitudinal direction of one [ a passage and / said ] dipole antenna.

[0014] The diversity antenna equipment concerning this invention leans and installs the feeder way which supplies electric power to the dipole antenna of another side in one dipole antenna side.

[0015] the longitudinal direction of each component of a dipole antenna pair [ equipment / concerning this invention / diversity antenna ], and the ground — the longitudinal direction of a conductor has the include angle which is 45 degrees.

[0016] either of the two dipole antennas with which the diversity antenna equipment concerning this invention constitutes a dipole antenna pair, or both — setting — that point — the ground — a conductor — it is made to incline in a side

[0017] the diversity antenna equipment concerning this invention — the ground — the edge in alignment with the longitudinal direction of a conductor — bending — further — an all directions form — a conductor — the die length of a plate is changed according to an individual.

[0018]

[Embodiment of the Invention] Hereafter, one gestalt of implementation of this invention is explained.

Gestalt 1. drawing 1 of operation shows the outline configuration of the diversity antenna equipment concerning

the gestalt 1 of implementation of this invention. drawing — setting — 1 — the ground — a conductor, and 2 and 3 are parallel 2 tracks, respectively. 4 and 5 are dipole antennas, respectively, and they constitute a dipole antenna pair. 6 and 7 — respectively — a rectangular rectangle — a conductor — a plate — it is — the 1st conductor — \*\*\*\* is constituted. 8 and 9 — respectively — a rectangular rectangle — a conductor — a plate — the 2nd conductor — \*\*\*\* is constituted.

[0019] the ground — the conductor 1 has the rectangle (the same the following containing an outline rectangle). the ground from near the center of a dipole antenna pair [ tracks / 2 and 3 / parallel 2 ] — it has extended in the direction of a conductor 1 at the vertical, and the feeder way for dipole antennas 4 and 5 being alike, respectively, and supplying electric power is constituted. one half of the die length (the same the following containing about 1/2) of the 1st wavelength of the electric waves from which the frequency which transmits and receives dipole antennas 4 and 5 differs — having — the ground — it is installed in the field where it is a conductor 1 and parallel (the same the following including outline parallel), and height differs. moreover, the dipole antennas 4 and 5 — mutual — a rectangular cross (the same the following also including an outline rectangular cross) — carrying out — \*\*\*\* — and each longitudinal direction — the ground — it has the longitudinal direction of a conductor: 1, and the include angle of 45 degrees (the same the following also including 45 degrees of outlines), and is installed. Moreover, a dipole antenna 5 is left and installed above a dipole antenna 4.

[0020] a rectangle — a conductor — one half of the die length of the 2nd wavelength with a plate 6 shorter than the 1st wavelength — having — \*\*\*\* — a dipole antenna 4 — receiving — the ground — it is installed so that it may become are located in the opposite side and parallel [ a conductor 1 ] to a dipole antenna 4. a dipole antenna 4 and a rectangle — a conductor — the distance with a plate 6 is set up small enough compared with the 2nd wavelength.

[0021] a rectangle — a conductor — a plate 7 — one half of the die length of the 2nd wavelength — having — \*\*\*\* — a dipole antenna 5 — receiving — the ground — it is installed so that it may become are located in the opposite side and parallel [ a conductor 1 ] to this dipole antenna 5. a dipole antenna 5 and a rectangle — a conductor — the distance with a plate 7 is set up small enough compared with the 2nd wavelength.

[0022] a rectangle — a conductor — a plate 8 — the 1/2 or less die length of the 2nd wavelength — having — \*\*\*\* — a rectangle — a conductor — a plate 6 — receiving — the ground — a conductor 1 — the opposite side — being located — and a rectangle — a conductor — it is installed so that it may become parallel to a plate 6. a rectangle — a conductor — a plate 6 and a rectangle — a conductor — the distance with a plate 8 is less than [ 1/4 of the 2nd wavelength, or it ].

[0023] moreover, a rectangle — a conductor — a plate 9 — the 1/2 or less die length of the 2nd wavelength — having — \*\*\*\* — a rectangle — a conductor — a plate 7 — receiving — the ground — a conductor 1 — the opposite side — being located — and a rectangle — a conductor — it is installed so that it may become parallel to a plate 7. a rectangle — a conductor — a plate 7 and a rectangle — a conductor — the distance with a plate 9 is 1/4 or less [ of the 2nd wavelength ]. parallel 2 track 3, a dipole antenna 5, and a rectangle — a conductor — a plate 7 and a rectangle — a conductor — each center line of a plate 9 — the node of a dipole antenna 4 and parallel 2 track 2 — a passage — a dipole antenna 4 — it is set up so that it may be arranged in the field which intersects perpendicularly with a longitudinal direction.

[0024] Next, the principle of operation of the gestalt 1 of operation is explained. Dipole antennas 4 and 5 operate in the 1st wavelength, respectively. a rectangle — a conductor — electric power is supplied to a plate 6 by the electromagnetic coupling with a dipole antenna 4, and it operates in the 2nd wavelength. a rectangle — a conductor — electric power is supplied to a plate 7 by the electromagnetic coupling with a dipole antenna 5, and it operates in the 2nd wavelength. moreover, the dipole antennas 4 and 5 — mutual — intersecting perpendicularly — \*\*\*\* — and the ground — since it has the include angle of 45 degrees to the longitudinal direction of a conductor 1 — this diversity antenna equipment — the ground — transmission and reception become possible to \*\*45-degree polarization to the longitudinal direction of a conductor 1.

[0025] this diversity antenna equipment — the 1st and 2nd wavelength — receiving — in view of dipole antennas 4 and 5 — the ground — a conductor 1 and an opposite direction turn into the radiation direction. a rectangle — a conductor — plates 8 and 9 are installed in the radiation direction of this diversity antenna equipment, and since each die length is 1/2 or less [ of the 2nd wavelength ], in the 2nd wavelength, it operates as the wave director to each polarization.

[0026] a rectangle — a conductor — the die length of plates 8 and 9 has a way smaller than the case where it compares with the 2nd wavelength at the time of comparing with the 1st wavelength. Therefore, compared with

the guided wave operation over the 2nd wavelength, the guided wave operation over the 1st wavelength becomes weak. that is, a rectangle — a conductor — it becomes possible to mainly make the beam in the 2nd wavelength thin by installing plates 8 and 9. here — a rectangle — a conductor — the guided wave operation in the 2nd wavelength if the die length of plates 8 and 9 is shortened — small — becoming — these rectangles — a conductor — the shape of beam in case there are no plates 8 and 9 is approached. therefore, a rectangle — a conductor — the die length of plates 8 and 9 is changed mutually, or it becomes possible to mainly change the configuration of the beam in the 2nd wavelength by omitting one side.

[0027] Moreover, the dipole antenna 5 is arranged to the longitudinal direction of a dipole antenna 4 in the symmetric position in the node of a dipole antenna 4 and parallel 2 track 2 of the feeder way. Consequently, high isolation is obtained between a dipole antenna 4 and 5.

[0028] the various kinds which constitute diversity antenna equipment from drawing 1 — although conductors 4, 5, 6, 7, 8, and 9 are installed in space, it is also possible to manufacture by forming these conductors in the front face of dielectric materials, such as a substrate, and combining them. Moreover, although the purport using parallel 2 tracks 2 and 3 as a feeder way was indicated with the gestalt 1 of this operation in order to supply electric power to a dipole antenna pair, it is also possible to be what connected the balanced unbalance converter and to substitute unbalanced lines, such as a coaxial track and the strip line, for this. Moreover, as shown in drawing 2, two unbalanced lines of coaxial cables 21 and 22 are used instead of parallel 2 tracks 2 and 3, the phase of 180 degrees is given and each unbalanced line may be made to supply electric power.

[0029] As mentioned above, according to the gestalt 1 of operation, it can send and receive to two \*\*45-degree polarization, and is small-scale compared with the former, and the effectiveness which can be operated as a diversity antenna and can make the shape of beam thin to the 2nd wavelength is acquired. furthermore, a rectangle — a conductor — by choosing the die length of plates 8 and 9, it is possible to carry out a change setup somewhat freely, in addition a dipole antenna 4 and the effectiveness that high isolation can be taken among five are acquired.

[0030] Gestalt 2. drawing 3 of operation shows the outline configuration of the diversity antenna equipment concerning the gestalt 2 of implementation of this invention. drawing — setting — 1 — the ground — a conductor, and 2 and 3 — respectively — parallel 2 track, and 4 and 5 — respectively — a dipole antenna; and 10 and 11 — respectively — a rectangle — a conductor — it is a plate. a rectangle — a conductor — as for a plate (the 1st conductor plate) 10, die length of one side has one half of the squares (the same the following containing an outline square) of the 2nd wavelength. moreover, a rectangle — a conductor — as for a plate (the 2nd conductor plate) 11, die length of one side has 1/2 or less square of the 2nd wavelength. The fundamental configuration of this diversity antenna equipment is similar to the gestalt 1 of operation. a rectangle [ in / here / the gestalt 1 of operation ] — a conductor — plates 6 and 7 — a rectangle — a conductor — a plate 10 — replacing — moreover, a rectangle — a conductor — plates 8 and 9 — a rectangle — a conductor — it has structure replaced with a plate 11.

[0031] Next, the principle of operation of the gestalt 2 of operation is explained. The fundamental principle of operation is the same as that of the gestalt 1 of operation. the rectangle constituted by the square — a conductor — a plate 10 has the same resonance frequency to the current of the longitudinal direction of a dipole antenna 4, and the current of the longitudinal direction of a dipole antenna 5. a rectangle [ in / electrically / as for these two currents; it is possible to make it operate independently, respectively, since it lies at right angles mutually, and / the gestalt 1 of operation ] — a conductor — the same actuation as plates 6 and 7 is carried out. further — a rectangle — a conductor — the rectangle which replaced plates 8 and 9 — a conductor — a plate 11 operates similarly.

[0032] according to the gestalt 2 of operation as mentioned above — the effectiveness of the gestalt 1 of operation — adding — a component — constitutionally — a rectangle — a conductor — since it becomes possible to reduce the number of plates, it can simplify, and it is effective in the ability to aim at improvement in machining nature.

[0033] Gestalt 3. drawing 4 of operation shows the outline configuration of the diversity antenna equipment concerning the gestalt 3 of implementation of this invention. drawing — setting — 1 — the ground — a conductor, and 2 and 3 — respectively — parallel 2 track, and 4 and 5 — respectively — a dipole antenna, and 10 and 11 — respectively — a rectangle — a conductor — it is a plate. Although the fundamental configuration is the same as that of the gestalt 2 of operation, it is having structure where parallel 2 track 3 in the gestalt 2 of operation was leaned to the dipole antenna 4 side here. however, the dipole antenna 5 — the ground — there is no change in an parallel thing to a conductor 1.



[0034] Next, the principle of operation is explained. The fundamental principle of operation is the same as that of the gestalt 2 of operation. In the case of the gestalt 3 of operation, as shown in drawing 5, a dipole antenna 4 exists in the location offset to the feeding point 51 of a dipole antenna 5. Therefore, when electric power is supplied to a dipole antenna 5, the current which is in phase and flows produces the dipole antenna 4 and parallel 2 track 2 top, a radiation component as this shows to drawing 6 arises, and there is a possibility of disturbing a radiation property. However, this current can mitigate the above-mentioned amount of offset by making it small. As a means for that, the above-mentioned amount of offset is reduced with the gestalt 3 of this operation by leaning parallel 2 track 3 in the direction of a dipole 4.

[0035] According to the gestalt 3 of operation, in addition to the effectiveness of the gestalt 2 of operation, there is effectiveness which can make small turbulence of the radiation property of a dipole antenna 5.

[0036] Gestalt 4. drawing 7 of operation shows the outline configuration of the diversity antenna equipment concerning the gestalt 4 of implementation of this invention. drawing — setting — 1 — the ground — a conductor, and 2 and 3 — respectively — parallel 2 track, and 4 and 5 — respectively — a dipole antenna, and 9 and 10 — respectively — a rectangle — a conductor — it is a plate. a rectangle [ in / here / the gestalt 3 of operation ] although the fundamental configuration is the same as that of the gestalt 3 of operation — a conductor — a rectangular rectangle which used the plate 11 with the gestalt 1 of operation — a conductor — the points replaced with a plate 9 differ.

[0037] Next, the principle of operation is explained. The fundamental principle of operation is the same as that of the gestalt 3 of operation. the gestalt 4 of operation — a rectangular rectangle — a conductor — a rectangle [ as opposed to / since the plate 9 is used / the polarization of a dipole antenna 4 ] — a conductor — there is no component which operates as the wave director of a plate 10, and it becomes possible to extend the beam in the 2nd wavelength of the polarization of a dipole antenna 4 compared with the case where it is the gestalt 3 of operation.

[0038] According to the gestalt 4 of operation, in addition to the diversity antenna equipment of the gestalt 3 of operation, it is effective in the ability to offer a means to change the shape of beam.

[0039] Gestalt 5. drawing 8 of operation shows the outline configuration of the diversity antenna equipment concerning the gestalt 5 of implementation of this invention. drawing — setting — 1 — the ground — as for a conductor, and 2 and 3, parallel 2 track, and 4 and 5 are dipole antennas, respectively. 9 and 10 — respectively — a rectangle — a conductor — a plate and the rectangle to which 12 and 13 were newly added, respectively — a conductor — it is a plate. the rectangle with die length shorter [ the 2nd wavelength ] than  $1/2$  or it although the fundamental configuration is the same as that of the gestalt 4 of operation in addition to the configuration of the gestalt 4 of operation here — a conductor — plates 12 and 13 are installed. these rectangles — a conductor — plates 12 and 13 — the ground — in a field parallel to a conductor 1, it is parallel to a dipole antenna 4, and it is arranged, respectively so that a dipole antenna 5 may be inserted into the symmetry. a dipole antenna 4 and an all directions form — a conductor — the distance of plates 12 and 13 is set as one fourth of the 2nd wavelength (the same the following containing about  $1/4$ ), respectively.

[0040] Next, the principle of operation is explained. The fundamental principle of operation is the same as that of the gestalt 4 of operation. the all directions form installed in the direction of a side face of a dipole antenna 4 with the gestalt 5 of operation — a conductor — since die length is  $1/2$  or less [ of the 2nd wavelength ], plates 12 and 13 mainly have a guided wave operation to the 2nd wavelength. therefore, the rectangle to the polarization of a dipole antenna 4 — a conductor — it becomes possible to change the shape of beam of breadth and the 2nd wavelength in the direction of a side face of the beam of a plate 10. moreover, a rectangle — a conductor — when plates 12 and 13 and a thing of the same kind are prepared to a dipole antenna 5, it can consider as a means to change the shape of beam of the 2nd wavelength.

[0041] according to the gestalt 5 of operation — the both-sides surface part of either of the dipole antennas 4 and 5, or both — receiving — a rectangle — a conductor — it is effective in changing the shape of beam in the 2nd wavelength by forming plates 12 and 13. Moreover, this means is applicable similarly, respectively, even if it carries out to the gestalt 1 of operation thru/or the diversity antenna equipment of 3.

[0042] Gestalt 6. drawing 9 of operation shows the outline configuration of the diversity antenna equipment concerning the gestalt 6 of implementation of this invention. drawing — setting — 1 — the ground — as for a conductor, and 2 and 3, parallel 2 track, and 4 and 5 are dipole antennas, respectively. 10 — a rectangle — a conductor — a plate, and 14 and 15 — respectively — the shape of a strip of paper — it is a conductor. the rectangle in the gestalt 3 of operation here although the fundamental configuration is the same as that of the gestalt 3 of operation — a conductor — a plate 11 — the shape of a strip of paper — the places replaced with

conductors 14 and 15 differ. the shape of a strip of paper — a conductor 14 — die length —  $1/2$  or less [ of the 2nd wavelength ], and width of face — the 2nd wavelength — comparing — the conductor of a sufficiently small rectangle — a piece — two or more — using — a dipole antenna 4 — parallel and a rectangle — a conductor — a plate 10 — receiving — the ground — it consists of arranging crosswise in the field of the opposite side in a conductor 1. the shape of moreover, a strip of paper — a conductor 15 — a configuration — the shape of a strip of paper — although it is the same as that of a conductor 14 — a conductor — it is installed so that the direction of the rectangle of a piece may become parallel to a dipole antenna 5.

[0043] Next, the principle of operation is explained. The fundamental principle of operation is the same as that of the gestalt 3 of operation. the gestalt 6 of operation — the shape of a strip of paper — each rectangle of a conductor 14 — a conductor — since the piece is parallel to a dipole antenna 4 and the die length is  $1/2$  or less [ of the 2nd wavelength ] — each rectangle — induction of the current of a direction parallel to a dipole antenna 4 is carried out to a conductor, and it operates as the wave director. On the other hand, since it is divided small enough to the longitudinal direction of a dipole antenna 5 compared with the 2nd wavelength, induction of the current of a direction parallel to a dipole antenna 5 is not carried out. Therefore, the operation as the wave director does not arise to a dipole antenna 5. the same reason — the shape of a strip of paper of another side — a conductor 15 acts as the wave director to a dipole antenna 5, and the operation as the wave director does not produce it to a dipole antenna 4.

[0044] using the above configuration — the shape of for example, a strip of paper — the shape of a strip of paper which saw only the beam direction in the 2nd wavelength to the polarization of a dipole antenna 4 from the dipole antenna 4 when only the location of a conductor 14 was offset — it becomes possible to make it change in the direction of a conductor 14. each shape of moreover, a strip of paper — if the width of face of whole each of conductors 14 and 15 is changed, it is possible to change the beam width in the 2nd wavelength according to an individual to the polarization of dipole antennas 4 and 5.

[0045] according to the gestalt 6 of operation, in addition to the effectiveness of the gestalt 3 of operation, the beam direction in the 2nd wavelength is changed according to an individual to dipole antennas 4 and 5 — it can make — the shape of moreover, a strip of paper — when the width of face of whole each of conductors 14 and 15 is changed, it is effective in the ability to change the beam width in the 2nd wavelength according to an individual to dipole antennas 4 and 5.

[0046] Gestalt 7. drawing 10 of operation shows the outline configuration of the diversity antenna equipment concerning the gestalt 7 of implementation of this invention. drawing — setting — 1 — the ground — a conductor, and 2 and 3 — respectively — parallel 2 track, and 4 and 5 — respectively — a dipole antenna, and 10 and 11 — respectively — a rectangle — a conductor — it is a plate. both the points of the dipole antenna 4 in the gestalt 3 of operation here although the fundamental configuration is the same as that of the gestalt 3 of operation — the ground — the points which incline in the conductor 1 side differ.

[0047] Next, the principle of operation is explained. The fundamental principle of operation is the same as that of the gestalt 3 of operation. the gestalt 7 of operation — the point of a dipole antenna 4 — the ground — since it bends and inclines in the conductor 1 side, a dipole antenna 4 operates as a reverse V character dipole, and becomes possible [ extending the beam width ]. Since the dipole antenna pair is mainly operating in the 1st wavelength, the beam width which changes here is mainly the thing of the 1st wavelength. In addition, although drawing 10 showed the thing which made the dipole antenna 4 incline to parallel 2 track, when the dipole antenna 5 of another side is made to incline similarly, the beam width of a dipole antenna 5 can be extended.

[0048] According to the gestalt 7 of operation, in addition to the effectiveness of the gestalt 3 of operation, it is effective in the ability to mainly change the beam width in the 1st wavelength of dipole antennas 4 and 5.

[0049] Gestalt 8. drawing 11 of operation shows the outline configuration of the diversity antenna equipment concerning the gestalt 8 of implementation of this invention. drawing — setting — 1 — the ground — a conductor, and 2 and 3 — respectively — parallel 2 track, and 4 and 5 — respectively — a dipole antenna, and 10 and 11 — respectively — a rectangle — a conductor — it is a plate. although the fundamental configuration is the same as that of the gestalt 3 of operation — here — the ground — it differs in that the both ends 101,102 in alignment with the longitudinal direction of a conductor 1 are bent at the dipole antenna pair side.

[0050] Next, the principle of operation is explained. The fundamental principle of operation is the same as that of the gestalt 3 of operation. Although the time of transmission is described here, the same is said of the time of reception. the ground — a conductor 1 has the operation which reflects the power emitted from the dipole antenna pair. the shape of beam of this diversity antenna equipment — each dipole antennas 4 and 5 and a rectangle — a conductor — the direct wave emitted from plates 10 and 11, and the ground — it is determined

by the sum of the reflected wave from a conductor 1. therefore, the ground — the both ends 101,102 of a conductor 1 — a dipole antenna pair side — bending — the ground — the configuration of a conductor 1 is changed and it becomes possible to change the shape of beam of the whole diversity antenna equipment by changing the condition of a reflected wave. the 1st wavelength from dipole antennas 4 and 5, and a rectangle — a conductor — a plate 10 and a rectangle — a conductor — the wave of the 2nd wavelength emitted from a plate 11 — the ground — since a conductor 1 side is also reached — the ground — it becomes possible to the formation of a form status change of a conductor 1 to change the shape of beam of the whole diversity antenna equipment.

[0051] drawing 11 — the ground — although the example which bent the both ends 101,102 of a conductor 1 to the dipole pair side was shown — others — the ground — it turned out that effectiveness with the same said of making it what bent the conductor 1 to the opposite side, the thing which carried out the crest chip box along with the center line of a longitudinal direction, or a trough chip box is acquired. in addition, the ground — although changing the configuration of a conductor 1 gives change at coincidence to the shape of beam of the 1st wavelength and the 2nd wavelength, the shape of beam in the 2nd wavelength uses together the means shown in the gestalt 1 of operation thru/or 6 — it is — the ground — it becomes possible to return to the shape of beam before changing the configuration of a conductor 1. That is, the shape of beam in the 1st wavelength and the shape of beam in the 2nd wavelength can be changed according to an individual at arbitration by combining the means of the gestalt 1 of operation thru/or the gestalt 8 of 7 and operation.

[0052] As stated above, according to the gestalt 8 of operation, the effectiveness that the shape of beam in the 1st and 2nd wavelength can be changed according to an individual by using together the means shown in the gestalt 1 of operation thru/or 6 in addition to the effectiveness of the gestalt 3 of operation is acquired.

[0053]

[Effect of the Invention] The height from a conductor differs, respectively. as mentioned above — according to this invention — the rectangular ground — a conductor and this ground — a conductor — parallel — the ground — The dipole antenna pair which consists of two dipole antennas which have one half of the die length of the 1st wavelength of the electric waves from which the frequency which it is installed so that it may intersect perpendicularly mutually, and each transmits and receives differs, the ground from near the center of a dipole antenna pair — with 2 sets of feeder ways for extending in a vertical, and a dipole antenna being alike in the direction of a conductor, respectively, and supplying electric power to it It is located in the opposite side with a side. a dipole antenna pair — receiving — parallel — the ground — a conductor — the ground — the rectangle of two rectangles in which the height from a conductor differs, respectively, and it is arranged so that it may intersect perpendicularly mutually, and each has one half of the die length of the 2nd wavelength shorter than the 1st wavelength — a conductor — the 1st conductor which consists of a plate — with \*\*\*\* The height from a conductor differs, respectively. the 1st conductor — \*\*\*\* — parallel — the ground — a conductor — a side — the opposite side — being located — the ground — and the rectangle of two rectangles in which it is arranged so that it may intersect perpendicularly mutually, and each has the 1/2 or less die length of the 2nd wavelength — a conductor — the 2nd conductor which consists of a plate, since it constituted so that it might have \*\*\*\* it can transmit and receive to two polarization and operates as a small-scale diversity antenna — it can make — the 2nd wavelength — receiving — the 2nd conductor — it is effective in \*\*\*\* operating as the wave director and making the shape of beam thin.

[0054] The height from a conductor differs, respectively. according to this invention — the rectangular ground — a conductor and this ground — a conductor — parallel — the ground — The dipole antenna pair which consists of two dipole antennas which have one half of the die length of the 1st wavelength of the electric waves from which the frequency which it is installed, and is transmitted and received so that it may intersect perpendicularly mutually differs, the ground from near the center of a dipole antenna pair — with 2 sets of feeder ways for extending in a vertical, and a dipole antenna being alike in the direction of a conductor, respectively, and supplying electric power to it a dipole antenna pair — parallel — a dipole antenna pair — receiving — the ground — a conductor — the 1st square conductor with which it is located in the opposite side with a side, and one side has one half of the die length of the 2nd wavelength shorter than the 1st wavelength — with a plate the 1st conductor — a plate — parallel — the ground — a conductor — the 2nd square conductor with which it is located in the opposite side with a side, and one side has the 1/2 or less die length of the 2nd wavelength, since it constituted so that it might have a plate it can transmit and receive to two polarization and operates as a polarization diversity antenna — it can make — the 2nd wavelength — receiving — the 2nd conductor — it is effective in a plate operating as the wave director and making the shape of beam thin.

furthermore, a component — constitutionally — a rectangle — a conductor — there are few plates, it ends and there is effectiveness which can be considered as a simple configuration.

[0055] according to this invention — the 2nd conductor — the rectangle which constitutes \*\*\*\* — a conductor — since it constituted so that it might be set as die length which omits one side of a plate or is different from another side — a rectangle — a conductor — it is effective in the ability to carry out a change setup of the shape of beam somewhat freely to the 2nd wavelength by choosing the die length of a plate.

[0056] Die length of a piece is  $1/2$  or less [ of the 2nd wavelength ]. according to this invention — the 2nd conductor — the rectangle which constitutes \*\*\*\* — a conductor — two or more conductors which arranged both both [ one side or ] in the shape of a strip of paper — the shape of a strip of paper which consists of a piece — a conductor — replacing — a conductor — Since it constituted so that width of face might consider as a sufficiently small rectangle compared with the 2nd wavelength the beam direction in the 2nd wavelength is changed according to an individual to each dipole antenna — it can make — each shape of moreover, a strip of paper — the width of face of the whole conductor is changed and the beam width in the 2nd wavelength is also effective in the ability to make it change according to an individual.

[0057] according to this invention — the 2nd conductor. — two or more conductors which arranged the plate in the shape of a strip of paper — the shape of 2 sets of strips of paper which consists of pieces — a conductor — replacing — a conductor — the die length of a piece or less [ of the 2nd wavelength ] by  $1/2$  a conductor — the width of face of a piece — the 2nd wavelength — comparing — a sufficiently small rectangle — it is — the shape of a strip of paper — one side of a conductor — the conductor — the longitudinal direction of a piece — the longitudinal direction of one dipole antenna — a list — the shape of a strip of paper — another side of a conductor — the conductor — since it constituted so that the longitudinal direction of a piece might be located in a line with the longitudinal direction of the dipole antenna of another side, it is effective in the ability to change the beam direction in the 2nd wavelength according to an individual to each dipole antenna.

[0058] according to this invention — the 2nd rectangle — a conductor — a plate — a rectangular rectangle — a conductor — since it constituted so that it might transpose to a plate — the 2nd conductor — a beam [ in / a plate operates as the wave director and / the 2nd frequency of a dipole antenna 4 ] — it can extend — further — a component — constitutionally — a rectangle — a conductor — there are few plates, it ends and there is effectiveness which can be considered as a simple configuration.

[0059] both both [ either or ] which constitute a dipole antenna pair according to this invention — receiving — die length — the rectangle of  $1/2$  or less rectangle of the 2nd wavelength — a conductor — two plates — the ground — it is in a field parallel to a conductor, it is parallel to a dipole antenna, and since it constituted so that a dipole antenna might be inserted, and it might arrange to the both-sides side side of that dipole antenna, respectively, it is effective in the ability to change the shape of beam in the 2nd wavelength.

[0060] Since according to this invention it constituted so that the dipole antenna of another side and the center line of that feeder way might be installed in the field which intersects perpendicularly the node of one dipole antenna and its feeder way to the longitudinal direction of one [ a passage and ] dipole antenna, and the dipole antenna of another side is arranged to the longitudinal direction of one dipole antenna in the symmetric position, the effectiveness that high isolation is obtained is among both dipole antennas.

[0061] Since according to this invention it constituted so that the feeder way which supplies electric power to the dipole antenna of another side might be leaned and installed in one dipole antenna side, the current which is in phase and flows one dipole antenna and its feeder on the street is reduced, and there is effectiveness which can make small turbulence of the radiation property of the dipole antenna of another side.

[0062] according to this invention — the longitudinal direction of each component of a dipole antenna pair, and the ground — since it constituted so that it might have the include angle whose longitudinal direction of a conductor is 45 degrees — the ground — there is effectiveness which makes transmission and reception possible to \*\*45-degree polarization to the longitudinal direction of a conductor.

[0063] either of the two dipole antennas which constitute a dipole antenna pair according to this invention, or both — setting — that edge — the ground — a conductor — since it constituted so that it might be made to incline in a side, it is effective in the ability to mainly change the beam width in the 1st wavelength of both dipole antennas.

[0064] according to this invention — the ground — the edge in alignment with the longitudinal direction of a conductor — bending — further — an all directions form — a conductor — since it constituted so that the die length of a plate might be changed according to an individual, it is effective in the ability to change the shape of beam in the 1st and 2nd wavelength according to an individual.

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[Translation done.]

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DESCRIPTION OF DRAWINGS

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## [Brief Description of the Drawings]

[Drawing 1] It is the perspective view showing the outline configuration of the diversity antenna equipment concerning the gestalt 1 of implementation of this invention.

[Drawing 2] It is the explanatory view showing the example of electric supply structure of the diversity antenna of the gestalt 1 of operation.

[Drawing 3] It is the perspective view showing the outline configuration of the diversity antenna equipment concerning the gestalt 2 of implementation of this invention.

[Drawing 4] It is the perspective view showing the outline configuration of the diversity antenna equipment concerning the gestalt 3 of implementation of this invention.

[Drawing 5] It is the top view of the diversity antenna pair for explaining actuation of the gestalt 3 of operation.

[Drawing 6] The gestalt 3 of operation is the explanatory view showing the phenomenon of the target dipole antenna.

[Drawing 7] It is the perspective view showing the outline configuration of the diversity antenna equipment concerning the gestalt 4 of implementation of this invention.

[Drawing 8] It is the perspective view showing the outline configuration of the diversity antenna equipment concerning the gestalt 5 of implementation of this invention.

[Drawing 9] It is the perspective view showing the outline configuration of the diversity antenna equipment concerning the gestalt 6 of implementation of this invention.

[Drawing 10] It is the perspective view showing the outline configuration of the diversity antenna equipment concerning the gestalt 7 of implementation of this invention.

[Drawing 11] It is the perspective view showing the outline configuration of the diversity antenna equipment concerning the gestalt 8 of implementation of this invention.

[Drawing 12] It is the perspective view showing the outline structure of the antenna equipment for the conventional mobile base stations.

## [Description of Notations]

1 the ground — a conductor, and 2 and 3 Parallel 2 track, and 4 and 5 A dipole antenna, and 6, 7, 8, 9, 10, 11, 12 and 13 a rectangle — a conductor — a plate, and 14 and 15 the shape of a strip of paper — a conductor, and 21 and 22 A coaxial cable, and 41 and 51 The feeding point and 101,102 Both ends.

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[Translation done.]

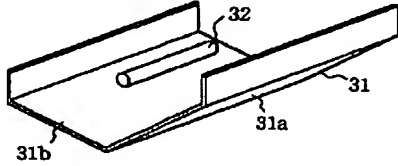
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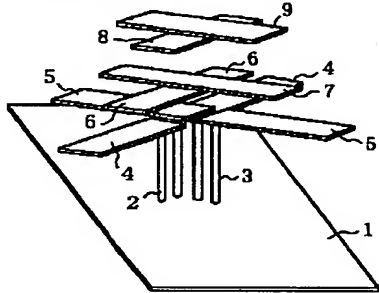
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## DRAWINGS

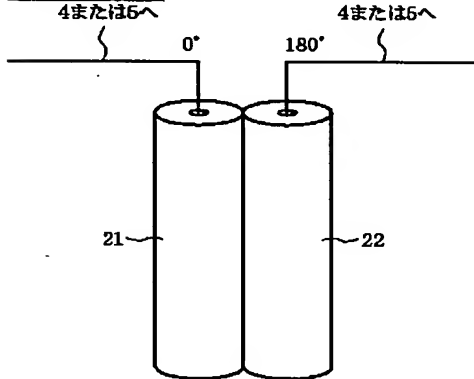
[Drawing 12]



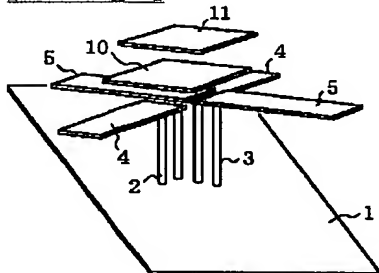
[Drawing 1]



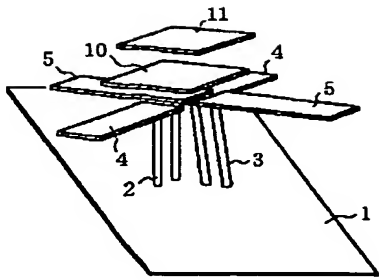
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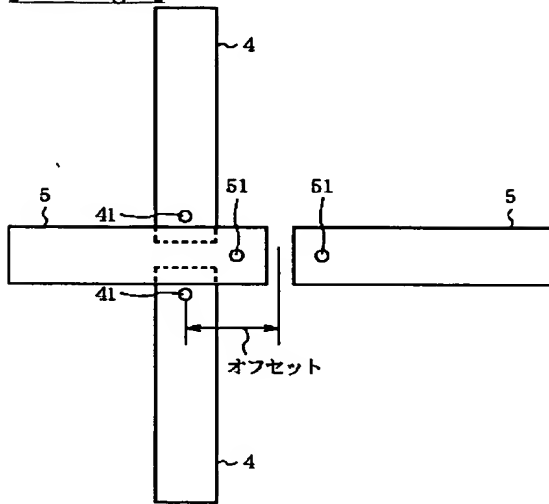
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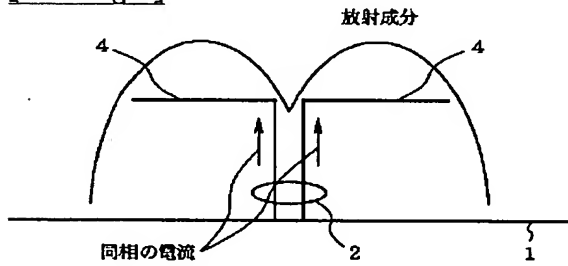
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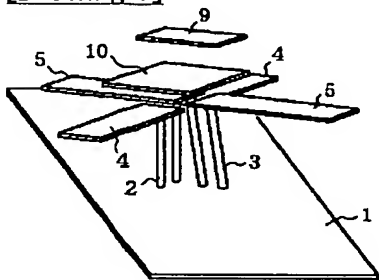
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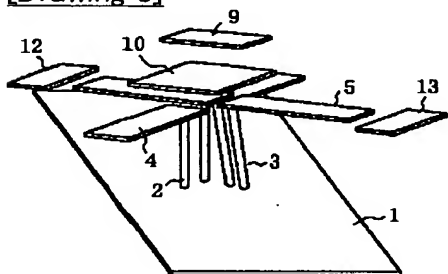
[Drawing 6]



[Drawing 7]

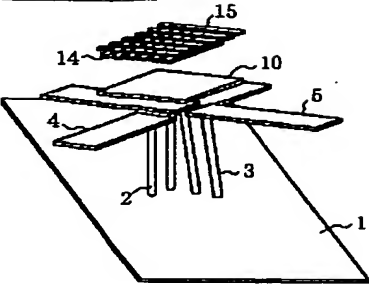


[Drawing 8]

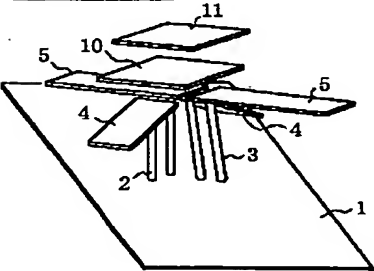




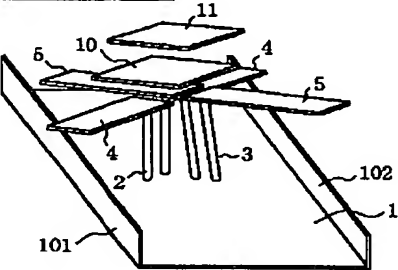
[Drawing 9]



[Drawing 10]



[Drawing 11]



[Translation done.]